

PRECISION DUAL MITER SANDER

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Pg. 1

This sanding machine will accomplish, by orienting the sanding disc in a horizontal plane & providing a vertical guiding surface with precision located rows of guide pins oriented at 45 degrees to the disc on both sides of the vertical plate will accommodate, the sanding of two (2) molding miters at the same time without the need to reposition any guides. Because all the surface of the disc is exposed (except for area under the vertical plate) sanding of the moldings can be accomplished in such a manner that sanding is always in a downward direction from the top surface of the sanded molding on each side of the vertical guide plate with the motorized v-belt driven disc always rotating in one direction. Fig. (1)

An additional slip on multi-angle guide can be utilized to accommodate sanding of any angle up to 90 degrees

~~FIG 12-16~~ A vacuum hose attachment plate & fitting is provided to keep the disc & surrounding work area clean.

Fig. ~~12~~ 11:

The drive motor could be mounted as shown Fig. (1) on the top surface of the machine or below the bottom if the machine is set up to use the available wall mounting brackets.

By having the disc almost entirely exposed, the sanding pad can be removed & replaced without disassembling any of the precision components as described on page

The sanding disc can be adjusted to obtain a precise 45 degree angle to the row of guide pins on either side of the vertical plate & can also be adjusted to obtain precise perpendicular angle on both sides of the vertical plate by an arrangement of a floating bearing plate that contains precision, pre loaded, ball & roller bearings connected to & supporting the disc. This plate can be tilted in any direction by the adjustment of four (4), more or less, jack

screws and four (4) , more or less , clamping screws accessible from the underside of the sander & located on the main cross bar that connects the base & the vertical plate to the disc . Fig. (6)

The disc RPM is controlled by the known motor RPM with attached v-belt pulley diameter & the v-groove machined into the diameter of the disc to create an approximately 1 : 10 ratio or about 200 RPM (this can be readily changed by replacement of the motor pulley) Fig. (6)

I have found , through testing , that this slower speed is advantageous when sanding fillets or small miters (or other delicate small miters) and plastic composition moldings as it will not melt the mitered edges as would a high speed sander (approx. 1750 RPM) . This slower speed with its ratio reduction allows the use of a lower horsepower drive motor that produces the necessary force to sand large hardwood or aluminum moldings .

The pivotal motor is mounted to a bracket secured to the base . The bracket contains a motor tensioning bolt & jam nut for correctly setting the v-belt tension . Fig. (7)

The disc bearings are pre - loaded by means of a central screw within the bearing retainer washer that screws into the bearing shaft mounted to the floating bearing plate . This screw is secured in place by means of a jamming set screw threaded into the same threaded hole as pre - load screw from the opposite end of the bearing shaft accessed from the underside of the sander . Fig. (6)



BACKGROUND OF INVENTION

Disc sanders are commonly known machines used in the picture framing , woodworking , cabinetry and other industries . Disc sanders are normally used with their discs operating in a vertical plane & their guide plates affixed to the sanders in a horizontal plane approximately at the centerline of the rotating disc , exposing only the upper area of the disc for use . In some versions , the area below the guide plate is enclosed around the disc and having a vacuum attachment while others have no enclosure and simply drop the residue on the floor . Most motorized sanders operate at a high rotational speed , approximately 1750 RPM , which is not desirable for sanding off minor amounts or delicate pieces . Manual sanders normally do not have vacuum attachments and are tiresome to use . When sanding mitered angles of a picture frame molding for example ; the back surface would be set against the horizontal guide surface with the outer surface of the moulding against a 45 degree , or other angle , guide allowing the mitered end to contact the disc . The sanding disc rotates in a direction to always sand towards the upper surface of the moulding so as not to create burrs on the top surface of the moulding . To sand the opposite end of the moulding piece , the outside surface guide will need to be slid or pivoted to form the opposite angle positioning . The moving or re-positioning of guides while performing a precision operation can be detrimental to performance & is time consuming .



Background of Invention (pg2)

In the sanders so far described only one quadrant , or $\frac{1}{4}$, of the total disc surface can be utilized at one time . Accordingly , this invention , by incorporating a horizontal sanding disc and a vertical (2) two sided guide plate with fixed 45 degree angle rows of guide pins on both sides , allows the sanding of the opposite ends of (2) two moulding pieces at the same time . This configuration also allows usage of (2) two quadrants ($\frac{1}{4} + \frac{1}{4}$) of the entire sanding disc area . One quadrant (up to $\frac{1}{4}$) of the disc area is used for operation of the vacuum plate . The configuration of the disc , in cooperation with its bearings and mounting plate , allows for adjustment of the disc axis to align it with the 45 degree guide pins and the vertical guide plate .



Brief Description of Drawings

Fig 1 Is a prospective view of the machine from the rear & left side so as to show the greater amount of features .

Fig 2 Is a plan view of the machine showing the base , the circular sanding disc , the pivotable drive motor , the vertical guide plate & the vacuum plate .

Fig 3 Is a frontal view along line 3-3 showing the base , the vertical guide plate , the pivotable drive motor with mounting bracket , and the mounting feet .

Fig 4 Is a right side end view along line 4-4 showing the base with rubber feet , the vertical guide plate with guide pins & mitered moulding , shown in phantom , in alignment with guide pins .

Fig 5 Is a left side view along line 5-5 showing the base with mounting feet , the vertical guide plate with pins & mitered moulding , shown in phantom , in alignment with guide pins , and the pivotable motor & mounting bracket

Fig 6 Is a bottom view along line 6-6 showing the underside of the machine base, the circular disc with it's supporting crossbar mounting plate, the motor drive pulley, the drive belt , the circular disc alignment screws , and the locking screws .

Breif Description of Drawings (pg 2)

Fig 7 Is a sectional view along line 7-7 showing the base, the vertical guide plate, the circular sanding plate with support plate , the riser blocks , the bearing plate , bearings & other components .

Fig 8 Is an enlarged setional view along line 8-8 showing the circular disc with bearings , support plate , allignment & locking screws , and other components .

Fig 9 Is an enlarged fragmented sectional view along line 9-9 showing the the base , vertical guide plate , riser block , circular disc , cross bar mounting plate, vacuum plate , base end cap with attachment screws , and mounting feet .

Fig 10 Is a sectional view along line 10-10 showing the base , vertical guide plate, vacuum plate , pivotable drive motor , drive pulley , v-belt , and other components .

Fig 11 Is a fragmented sectional view along line 11-11 showing the disc and vacuum plate .

Brief Description of Drawing (pg 3)

Fig 12 Is an end view along line 4-4 showing the multi-angled guide in use on the left hand side of the machine set up for the moulding of an eight sided frame .

Fig 13 Is an end view along line 5-5 showing the multi-angled guide in use on the right hand side of the machine .

Fig 14 Is a fragmented top view along line 14-14 showing the multi-angle guide and pins in cooperation with vertical guide plate .

Fig 15 Is a plan view of a multi-angle guide plate

Fig 16 Is a side view along line 16-16 of a multi-angle guide plate



DETAIL DESCRIPTION OF DRAWINGS

Turning to Fig 1 through 5 what is shown is a sanding machine comprised of a formed sheet metal base 1 with formed sheet metal end caps 2 & 3 attached to base 1 by screws 18 . A motor mounting plate 22 is attached to the base 1 by means of screws 37 . A pivotable motor 21 with cord & plug 33 is mounted to the motor plate 22 by means of bolt 17 and nut 23 . The pivoting of the motor 21 , or tensioning , is accomplished by adjusting the screw 15 threaded through mounting plate 22 and contacting the motor base plate . When correct belt 27 tension is accomplished , the jam nut 14 is locked against mounting plate 22 .

A vacuum plate 11 with a cylindrical flange for attaching a vacuum hose 13 is mounted on the upper surface of the base 1 and attached by means of screw 12 passing through the base 1 & threading into riser block 35 (also shown in Fig 11). Mounted to the top surface of the base 1 is vertical guide plate 5 with the cooperating horizontal guide pins 7 , 8 , 9 & 10 positioned so as to create an essentially 45 degree angle to the top surface of base 1 . Pins 7 & 8 create a locating line on the right side of the vertical plate 5 for the outside surface of a picture frame moulding B (and the like) , while the right side of the vertical plate 5 serves as a locating surface for the bottom surface of moulding B , pins 9 & 10 correspondingly create the same function on the left side of vertical guide plate 5 for moulding A . Horizontally located , slightly below the bottom surface of the vertical guide plate 5 and the top surface of base 1 , is a circular disc 4 with a sanding pad 6 adhered to its top surface . A clearance hole 19 in the top surface of base 1 allows access to the pad 6 for mouldings A & B .

Detail Description of Drawings (pg 2)

Turning to Fig 6 through 10 the disc 4 has a groove on its outer perimeter to accept a V-shaped , or the like , drive belt 27 cooperating with a smaller drive pulley 26 attached to shaft 41 of drive motor 21 by means of screw 25 . The larger diameter of the V-belt driven disc 4 allows for a speed reduction between the motor driven pulley 26 to approximately 220 disc 4 RPM thus providing a more desirable working speed for delicate sanding . At the center of disc 4 is a hole 65 for acceptance of bearing 40 and a counterbored clearance hole 66 for acceptance of a bearing snap ring (or bearing shoulder) 43 that seats on the surface 67 to establish a predetermined depth location for bearing 40 . Engaging the lower surface of disc 4 is a cylindrical roller bearing washer 45 centrally located by the outside diameter of bearing 40 and in cooperation with needle roller bearing & cage 44 and the bearing washer 45 that is in contact with bearing 44 and plate 38 , and is centrally located by spacer 46 . This configuration provides a thrust load capacity far in excess of what would normally be required .

The bearing 40 is centrally located by the coooperation of bearing shaft 41 in the center of bearing plate 38 that is located centrally atop of cross bar plate 28 . The bearing 40 is retained and preloaded by retainer 47 that is secured into place by preloading screw 48 and locked at correct preload by jam screw 32 . O-ring 39 creates a seal between disc 4 and bearing plate 38 and is centrally located by outer perimeter of the cage of bearing 44 . This O-ring 39 acts to seal in bearing 44 grease and seal out other contaminants .

The floatably mounted bearing plate 38 is secured by means of 4 (more or less) screws 30 passing through plate 28 and threading into plate 38 . Four (4) (more or less) jacking screws 31 are threaded into plate 28 and contact the lower side of plate 38 in a location central to the inner

diameter and outer diameter of the roller bearing 44 .

Detail Description of Drawings (pg 3)

The jacking screws 31 working in cooperation with mounting screws 30 allow the tilting , in any direction about its axis , of the entire disc 4 & bearings assembly to bring the disc into exact orientation with the 45 degree angle created by the pins 7 , 8 , 9 , & 10 located in the vertical guide plate 5 and into perpendicularity with the moulding locating surfaces of the vertical guide plate 5 .

The cross plate 28 carrying the disc 4 and bearing assembly is mounted at its ends to riser block 35 by means of screws 16 passing through plate 28 and threaded into block 35 .

The sub-assembly of the disc 4 , V-belt 27 , bearing assembly , cross bar 28 , and riser blocks 35 are slid into the open end of base 1 and attached to the base 1 by means of screws 16 that pass through the top surface of the base 1 and thread into block 35 .

Screws 29 pass through clearance hole 36 in the lower legs of base 1 and pass through plate 28 and block 35 to thread into vertical guide plate 5 creating a rigid unit of all the critical components of the invention .

Screws 18 pass through the top surface of base 1 and thread into end caps 2 & 3 . Screws 18 pass through feet 20 and through the lower surface of base 1 and thread into end caps 2 & 3 to rigidize the sheet metal components .

Detail Description of Drawings (pg 4)

Fig 11 is showing the relationship of vacuum plate 11 to the pad 6 affixed to disc 4 thus forming a small air gap between the lower surface of plate 11 and pad 6 to create a high speed air flow area created by the vacuum hose 13 attached to the circular flange on the top surface of plate 11 so as to evacuate sanding residue from the working area of the pad 6 .

Turning to Figures 12 through 16 what is shown is an essentially triangular plate (Fig 15 & 16) used in cooperation with vertical guide plate 5 and pins 7 , 8 , 9 & 10 of a thickness equal to or greater than the protrusion of pins 8 & 10 from their corresponding surfaces of plate 5 . Three (3) (more or less) pins 51 are pressed into holes 65 located on the same centerline with holes 52 & 57 to form a straight line . Hole 52 is used for slidability locating plate 50 on pin 7 then rotating plate 50 about pin 7 into orientation with holes 52 , 54 , 55 , 56 , or 62 to create a differing predetermined working angle for moulding(s) B of varying mitered angles that correspond to the number of sides of a frame . The plate 50 would be slid onto pins 7 & 8 so that the surface 64 would be in contact with vertical plate 5 .

The moulding B would then be placed with its bottom surface on surface 63 of plate 50 and with its outside surface against pins 51 for correct orientation ; for example , to sand the angle of moulding B for an eight sided picture frame , the plate 50 would be located with hole 52 on pin 7 and hole 55 on pin 8 to form a 22 degree 30 minute miter angle . Hole 55 corresponds with the numeral 8 and its associated line on plate 50 representing an 8 sided frame .

Detail Description of Drawings (pg 5)

The same plate **50** can be used on the left side of plate **5** for sanding the moulding **A** in the same 22 degree 30 minute configuration by locating hole **57** on pin **9** and hole **60** on pin **10** .

Therefore , as can be seen on plate **50** , holes **52 & 58** and their coresponding numeral **5** are used for five (5) sided frames , holes **54 & 59** for six (6) sided frames , holes **56 & 61** for twelve (12) sided frames, and hole **62** for setting up to sand at 90 degrees to the disc **4** and pad **6** .

Detail Description of Drawings (pg 6)

Turning to Figures 12 through 16 what is shown is an essentially triangular plate (Fig 15 & 16) used in cooperation with vertical guide plate 5 and pins 7 , 8 , 9 , & 10 of a thickness equal to or greater than the protrusion of pins 8 & 10 from their corresponding surfaces of plate 5 . Three (3) pins 51 are pressed into holes 65 located on the same centerline with holes 52 & 57 to form a straight line . Hole 52 is used for slidability locating plate 50 on pin 7 then rotating plate 50 about pin 7 into orientation with holes 53 , 54 , 55 , 56 , or 62 to create a differing predetermined working angle for moulding (s) B of varying mitered angles that correspond to the number of sides of a frame . The plate 50 would be slid onto pins 7 & 8 so that the surface 64 would be in contact with vertical plate 5 . The moulding B would then be placed with its bottom surface on surface 63 of plate 50 and with its outside surface against pins 51 for correct orientation ; for example , to sand the angle of moulding B for an eight (8) sided picture frame , the plate 50 would be located with hole 52 on pin 7 and hole 55 on pin 8 to form a 22 degree 30 minute miter angle . Hole 55 corresponds with the numeral 8 representing an 8 sided frame and its associated line on plate 50 .

Detail Description of Drawings (pg 7)

The same plate **50** can be used on the left side of plate **5** for sanding the moulding **A** in the same 22 degree 30 minute configuration by locating hole **57** on pin **9** and hole **60** on pin **10** . Therefore , as can be seen on plate **50** , holes **53 & 58** and their coresponding numeral **5** are used for five (5) sided frames , holes **54 & 59** for six (6) sided frames , holes **56 & 61** for twelve (12) sided frames , and hole **62** for setting up to sand at 90 degrees to the disc **4** and pad **6** .